Caulking and Weather Stripping

ENERGY SAVING - FACT SHEET

Benefits of a Tighter Building Envelope

Experiences over the past 20 years have shown that buildings are typically leakier than previously expected. Caulking and weather stripping efforts are usually the easiest and cheapest way to reduce air leaks. While weatherization efforts may not have a quick payback in terms of energy savings, such projects will make the interior space more comfortable, improve indoor air quality and HVAC function, and help improve worker productivity and morale.

Keeping Energy Inside the Building

Air-leaking cracks may be present for several reasons: the building was not tightly constructed in the first place; cracks developed as the building aged; or the original sealing material has dried out and pulled away. Even with very energy efficient building envelopes, your building will lose heat in cold weather and gain it when it is hot outside. Your main objective must be to minimize these losses and gains. To do this you will want to: 1) stop infiltration, 2) reduce heat transfer, and 3) control humidity. Each of these concerns can be controlled or at least minimized through good maintenance practices using caulking and weather stripping.

Guidelines for Locating and Identifying Structural Losses

Energy loss can be detected by use of a handheld infrared scanner. These scans will pick up cold spots on walls, windows, or ceilings and pinpoint missing insulation and open cracks. A less sophisticated approach is to feel around doors and windows and other building openings for drafts and leaks. Ask occupants where they notice drafts on windy days. A piece of tissue paper held at one end is also useful for locating drafts. Be sure to check crawl spaces and the roof, identifying each suspicious location.

Smaller places to inspect that may need sealing:

- where walls meet the foundation;
- in the foundation itself;
- where walls join at corners;
- around window air conditioners and other equipment installed in walls or on the roof;
- around places where piping, electrical conduits, or telephone lines enter the building or penetrate walls or ceilings between heated and unheated spaces;
- around the chimney (flue chase) of a furnace or boiler.

Science and Research on Air Infiltration in Commercial Buildings

It has often been assumed that commercial and institutional building envelopes are fairly tight, but limited existing data on the subject suggests otherwise. Studies by the National Institute for Standards and Technology (NIST) during the 1990s showed that air infiltration can have significant impact on building heating and cooling loads. A study of 25 buildings representing a variety of typical U.S. office buildings, showed that infiltration is responsible for an average of 13 percent of heating load and 4 percent of cooling load. In terms of total building energy use, the percentages would range from 1.2 to 5.2 percent for the Raleigh buildings in the study. In newer buildings the percentages are even higher. Studies show that air infiltration is not easily correlated with building age, configurations, or materials, so facility managers must examine opportunities on a case by case basis.

Sealing Cracks with Caulking or Other Materials

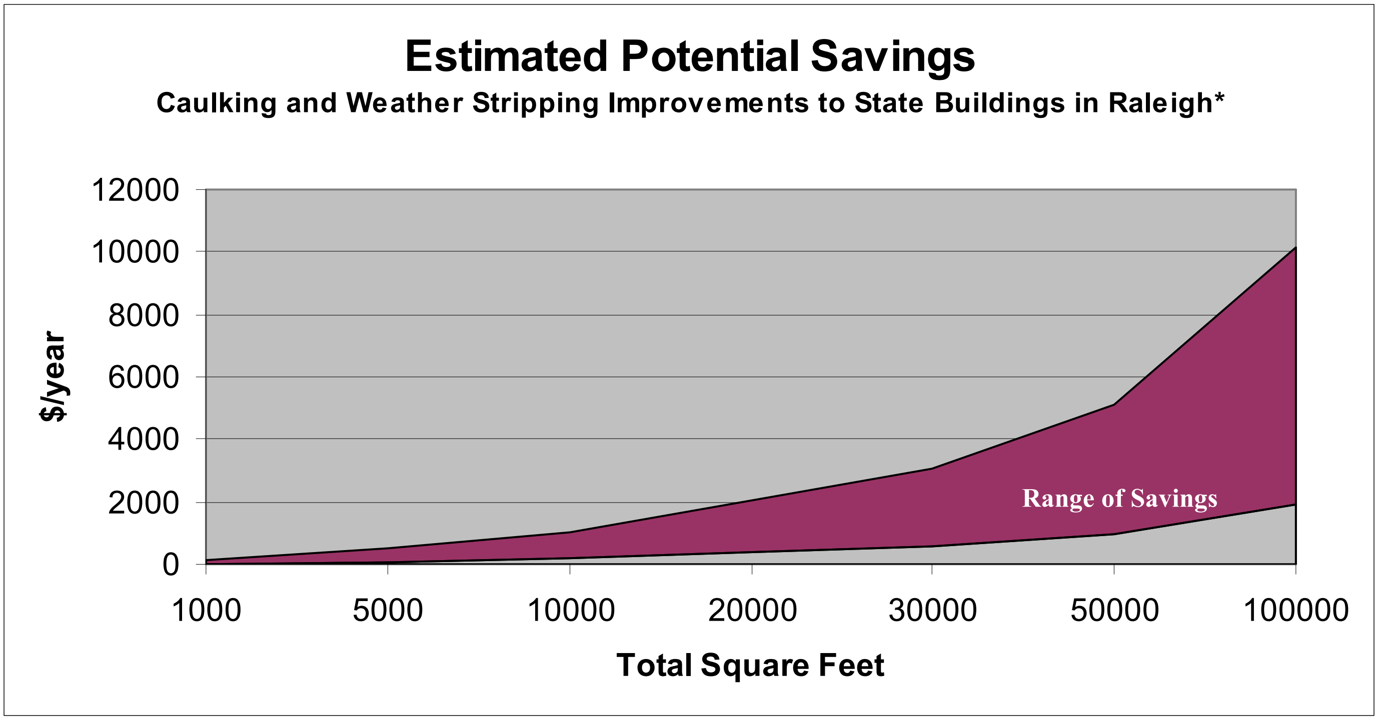
Start with the largest and easiest-to-fix openings. You will probably need a variety of sealing materials.

Install caulking where there is none, and remove and replace worn-out caulking. Use the highest quality caulking material; acrylics are easy to use and very long lived.

Fill large cracks with foam “stuffers” or glass fiber insulation before caulking them. Some masonry cracks will require cement rather than caulking.

Use sheet metal to close the opening around a flue chase.

Note that in multi-story commercial buildings, fire stopping is required for all vertical penetrations. Be certain that what you do is in accordance with code.



*The above estimates are based on a NIST study of air infiltration rates in two buildings using the actual total energy cost of $1.59/sf for state-owned facilities in Raleigh, NC.

Repair, Replace, or Install Weather Stripping at Doors and Windows

Tighten up window and door frames with screws and make sure they have weather stripping, especially between the upper and lower sashes of double hung windows and around all exterior doors, including thresholds. Pay special attention to the "weather side" of your building, where winds usually come from during cold or hot weather. If the existing weather stripping is good but has come loose, refasten it with adhesive, nails, screws, or staples, whichever is appropriate. If it has deteriorated or there is none, install the type that is designed for the particular purpose.

"It's only a little crack" - Example

A pair of exterior doors with no weather stripping can have an opening of ¼" where the doors meet. While this doesn't look or sound like much, on a 6' 8" high pair of doors, it adds up to the equivalent of a 20-square inch opening. A similar gap in just two average-size double-hung windows, where the sashes meet, would add up to the same 20 square inch hole! In a typical setting, this 20 square inch hole would allow over 40 cfm into or out of the building. This air infiltration could cost up to $54 per year in heating and cooling costs.

References & Resources:

1. Air Seal and Insulate with ENERGY STAR. www.energystar.gov/index.cfm?c=home_sealing.hm_improvement_sealing
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